Statement of

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Introduction

Chairman Upton, Ranking Member Pallone, Chairman Whitfield, Ranking Member Rush, and Members of the Subcommittee, thank you for the opportunity to testify today on behalf of the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) regarding energy efficiency.

In support of the Administration's all-of-the-above approach to energy and the Climate Action Plan, EERE leads DOE efforts as the U.S. Government's primary clean energy and energy efficiency technology organization—working with some of the Nation's best innovators and businesses to support high-impact applied research, development, and demonstration (RD&D) activities in the three sectors under our purview: sustainable transportation, renewable power, and energy efficiency. With Congress's support, we implement a range of strategies aimed at reducing U.S. reliance on oil, saving American families and businesses money, creating jobs, and reducing pollution. We work to ensure that the clean energy and energy efficiency technologies of today and tomorrow are invented and manufactured in America.

As Deputy Assistant Secretary for Energy Efficiency in the Office of Energy Efficiency and Renewable Energy (EERE), I am responsible for overseeing DOE's portfolio of energy efficiency research, development, demonstration, and deployment activities. The Building Technologies, Advanced Manufacturing, Weatherization and Intergovernmental Programs, and Federal Energy Management Program Offices develop and help provide businesses, consumers, and government agencies with innovative, cost-effective energy-saving solutions to improve their energy efficiency—from higher-efficiency products, to new ways of designing homes and buildings, to new ways of improving the energy intensity and competitiveness of American manufacturers. EERE's energy efficiency portfolio also supports better integrating the built environment with our energy system to combat costly peaks in energy demand and to increase the capabilities and value of buildings and facilities.

Energy efficiency is a large, low-cost, and underutilized U.S. energy resource. Increased energy efficiency offers savings on energy bills, opportunities for more jobs, and improved industrial competitiveness, and it will lower air pollution. I am pleased to be here today and look forward to working with Congress, and this Committee in particular, to talk about how we can use energy efficiency as a tool to help address our Nation's energy challenges. My statement today will address the energy efficiency bills currently before the Committee, and provide an update on DOE's energy efficiency portfolio, the challenges we are working to address, and the progress we are making.

Energy Efficiency Legislation

I have been asked to testify on the energy efficiency provisions contained within Title IV—"Energy Efficiency" currently before the Committee.

The Administration continues to review all of the legislation on the docket today, and has not formulated a position on the efficiency provisions contained within Title IV. .

The Administration strongly supports the goal of improving energy efficiency and continues to implement programs and initiatives that align with the President's Climate Action Plan. For example, the Department is on track to set efficiency standards as outlined under existing authority, which drive progress toward reducing carbon pollution by at least 3 billion metric tons cumulatively by 2030. In addition, the recent release of Executive Order 13693 will advance the energy efficiency and sustainability of the federal government—the nation's largest consumer of energy. The Department has a number of concerns with language that we believe undermines critical components of the President's Climate Action Plan, including its ability to effectively set efficiency standards. In addition, we have concerns with the proposed building energy codes provisions.

However, I will reiterate my appreciation for ongoing bipartisan efforts to promote energy efficiency—including this year's passage of the Energy Efficiency Improvement Act—and look forward to continuing to work with the Committee.

EERE's Energy Efficiency Portfolio

EERE's program offices are implementing a variety of strategies to improve the efficiency of our homes, buildings and manufacturers, similar to the activities highlighted in the legislation before the Committee today.

Building Technologies

Improving energy efficiency in our homes and buildings offers a tremendous opportunity to create well-paying jobs, save money for businesses and consumers, and make our air cleaner. Residential and commercial buildings consume more than 40 percent of the Nation's total energy and more than 73 percent of its electrical energy[1], resulting in an estimated annual national buildings energy bill of more than $430 billion.[2] This energy bill can be reduced by 20-50 percent through a variety of existing and emerging building energy efficiency technologies and techniques once these solutions are successfully developed, commercialized, and proven to be cost effective.

EERE's Building Technologies Program (BTO) will continue to develop and demonstrate advanced building efficiency technologies and practices to make buildings in the U.S. more efficient, affordable, and comfortable. Key recent EERE accomplishments in BTO include the following:

[1] Monthly Energy Review, Energy Information Administration, U.S. Department of Energy, November 2014, http://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf.
[2] Annual Energy Outlook, Energy Information Administration, U.S. Department of Energy, April 2014, http://www.eia.gov/forecasts/aeo/pdf/0383(2014).pdf.

- **Helping American commercial, industrial, and multifamily buildings become at least 20 percent more energy efficient by 2020.** Through the Better Buildings Challenge, more than 250 partners are achieving average energy savings of 2.5% annually. These partners are on track to achieve the goal of more than 20% energy savings over 10 years and have saved 36 trillion Btus and $300 million since the Challenge began in 2011.

- **Curbing greenhouse gas emissions with advanced refrigeration systems.** Through the Building Technologies Office's Emerging Technologies R&D program, a leading commercial refrigeration manufacturer worked with Oak Ridge National Laboratory to design a refrigeration system with 25% lower energy consumption and 78% lower GHG emissions than existing systems.

- **Providing consumers billions of dollars in energy savings.** As part of President Obama's Climate Action Plan, the Energy Department finalized ten energy efficiency standards in 2014. Altogether, those ten standards will help reduce carbon dioxide emissions by over 435 million metric tons, which is roughly the equivalent to the annual electricity use of 60 million homes,[3] and save American families and businesses $78 billion in utility bills through 2030.

The program uses a three-pronged strategy: (1) High Impact Technology Research and Development—research and development (R&D) targeting the greatest opportunities to develop high-impact new cost-effective energy efficiency products and solutions (i.e., the highest potential market and energy efficiency impact); (2) Technology-to-Market—validating and driving these technology products and solutions into the market by verifying and improving performance and cost, providing improved data and information, and partnering with manufacturers and users; and (3) Lock In Savings—where a government role is appropriate and justified, locking in the savings through market based (e.g., working with the Environmental Protection Agency on the ENERGY STAR Program) and regulatory (i.e., codes and standards) efforts that provide clear public and net economic benefits to both producers and consumers. The program invests in a balanced portfolio of activities that are determined to contribute optimally to national energy efficiency goals.

R&D on next-generation building technologies will lead to advances in end-uses representing the majority of building energy consumption, including efficient lighting that is cost-competitive in today's market, new technologies in heating and cooling, and windows that decrease energy demands and improve comfort. DOE also invests in whole building R&D that demonstrates how new energy efficient technologies can function together to create an efficient system, achieve greater overall savings, and inspire the next-generation of buildings. For homes, this will translate

[3] EPA Greenhouse Gas Equivalencies Calculator, http://www.epa.gov/cleanenergy/energy-resources/calculator.html.

into a new generation of housing stock that is durable, uses smarter energy management systems, and offers substantial energy savings.

In addition to creating energy efficiency opportunities in the new buildings market, DOE invests in activities that target the large savings potential that exists across the stock of existing homes, many built before modern codes. Here, the Department is working to reduce U.S. building-related energy use in existing homes by 20 percent by 2020 and 40 percent by 2030 through applied research (e.g. how builder/retrofitters can more cost effectively install technical solutions into homes). This research aims to resolve the major technology to market challenges to achieving these goals, develop infrastructure to support the construction or improvement of homes to meet higher performance levels, and demonstrate and then promote higher energy efficiency home retrofit and model homes for new construction that may be implemented at the state and local level.

The Better Buildings Challenge is a signature partnership effort to make our Nation's buildings 20% more energy efficient over the next ten years, with over 250 partners across the commercial, industrial, residential, and public sectors. Together, these partners account for approximately 3.5 billion square feet of building floor space, more than 600 manufacturing facilities, and $5.5 billion in private sector financing. As partners advance toward meeting their individual goals, the Better Buildings Challenge website[4] will highlight their commitment and progress, including the sharing of showcase projects and hundreds of replicable implementation models that other organizations can adopt. To date, more than $3 billion of the commitment from private sector financial firms has been extended to projects, and we are continuing to look for ways to expand access to private-sector financing, as this remains an important barrier cited by commercial building owners.

In addition, the Department sets minimum energy efficiency standards for approximately 60 categories of appliances and equipment used in homes, businesses, and other applications, as required by existing law. For most products, Congress passed laws that set initial federal energy efficiency standards and test procedures, and that established schedules for DOE to review and update these standards and test procedures. Since 2009, 25 new or updated standards, covering more than 30 products, have been issued and will ensure annual energy savings over the coming years. The Program is highly effective, achieving dramatic bang-for-the-buck in energy savings. Cumulative consumer utility bill savings associated with these recently enacted standards are projected to be hundreds of billions of dollars (undiscounted) through 2030.

Further, DOE assists with the adoption and implementation of state and local building codes for both commercial and residential buildings. Building energy codes are an existing solution that can provide between 20-30 percent whole building energy savings. The program assists states and

[4] The BBC website address is www.betterbuildings.energy.gov/challenge.

localities in adopting, complying with, and enforcing energy codes for residential and commercial buildings, resulting in higher-performing buildings that maximize cost-effective energy savings. Pacific Northwest National Laboratory estimates the annual impact of these activities to be over 100 trillion Btu of primary energy savings and almost $780 million in energy cost savings.[5] To accomplish its objectives in this area, DOE has developed a suite of assistance tools it routinely provides to state and local authorities.

In FY2016, DOE has requested $264,000,000 for the Building Technologies Office.

Advanced Manufacturing

The U.S. manufacturing sector offers important opportunities for cutting energy waste, while improving our industrial competitiveness and promoting economic growth. In the United States, manufacturing represents about 12% of the gross domestic product and nearly 12 million jobs.[6] While being a key sector underlying long-term economic growth, manufacturing also has an annual energy bill of about $200 billion and uses roughly one-third of the primary energy (and related GHG emissions) in the U.S.[7] U.S. manufacturing can particularly benefit from technologies for energy efficiency across the board, as industry must continually improve productivity and efficiency to remain globally competitive.

EERE's Advanced Manufacturing Office (AMO) partners with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality manufacturing jobs, enhance global competitiveness of the United States, and reduce energy use by encouraging a culture of continuous learning in corporate energy management. Key recent AMO accomplishments include:

- **Pushing the boundaries of additive manufacturing.** The EERE-supported Manufacturing Demonstration Facility (MDF) at Oak Ridge National Laboratory collaborated with private sector partners to design and prototype a 3D-printed car – all in just six months. This

[5] Pacific Northwest National Laboratory, Codes and Standards: http://eere.pnnl.gov/building-technologies/codes_standards.stm

[6] Full-time and Part-time employees by industry, U.S. Department of Commerce, http://www.bea.gov/iTable/iTable.cfm?reqid=5&step=4&isuri=1&402=43&403=1#reqid=5&step=4&isuri=1&402=43&403=1
Value added by industry as percentage of GDP, U.S. Department of Commerce, http://www.bea.gov/iTable/iTable.cfm?reqid=5&step=4&isuri=1&402=5&403=1#reqid=5&step=4&isuri=1&402=5&403=1

[7] Annual Energy Outlook 2014: Reference Case Data, U.S. Energy Information Administration, available from: http://www.eia.gov/forecasts/aeo/data.cfm

project was enabled through a partnership between the MDF and industry stakeholders, which developed breakthrough additive manufacturing processes and allowed industry to print more efficiently and on a larger scale than similar commercially available processes.

- **Assuring supply chains of materials critical to clean energy technologies.** The Critical Materials Institute (CMI), an Energy Innovation Hub for the U.S. Department of Energy (DOE), celebrated its second anniversary with twenty-seven invention disclosures. Critical materials, including some rare earth elements that possess unique magnetic, catalytic, and luminescent properties, are key resources needed to manufacture products for the clean energy economy.

- **Saving manufacturers money across the U.S.** Industrial Assessment Centers located within accredited engineering programs at 24 universities across the country conduct energy audit assessments at manufacturers' sites. According to analyses done by the program, on average, each manufacturer identifies about $140,000 in potential annual energy savings. Almost 17,000 manufacturers have benefited from the program and implemented savings resulting in approximately 5 million metric tons of carbon dioxide emission reductions[8].

AMO's research, development, demonstration, and deployment investments advance high-impact technologies for energy efficiency in the manufacturing sector in addition to foundational, cross-cutting manufacturing and materials technologies critical to efficient and competitive domestic manufacturing of clean energy products. AMO's investments in foundational technologies are anticipated to have a high impact in helping save energy and improve competitiveness and that will benefit multiple industries in the installed industrial base. When R&D investments are approached in this manner, the extensive supply chains associated with manufacturing multiply the government's initial investments from one industry to multiple applications in other industries and end-use products.

The Program addresses these clean energy manufacturing challenges in three primary ways: research and development of early stage manufacturing technologies through the support of individual R&D projects, pre-commercial technology development through facilities and manufacturing consortia, and technology assistance through manufacturing partnership participation, assessment and evaluation tools.

EERE leads the Department of Energy's *Clean Energy Manufacturing Initiative* which is a Department-wide approach to increase U.S. competitiveness in clean energy manufacturing while advancing progress toward the nation's energy goals. EERE-supported Clean Energy Manufacturing

[8] Internal analysis based on data from the Industrial Assessment Centers Database, http://iac.rutgers.edu/database

Innovation Institutes are public-private partnerships focusing on RD&D of foundational technologies that are broadly applicable and prevalent in multiple industries and markets within the energy sector and that have potentially transformational technical and productivity impacts for the U.S. manufacturing sector more broadly. All institutes will be actively managed through cooperative agreements with well-defined milestones, and oriented toward clearly stated research objectives and outcomes to ensure timely achievement of all technical, operational, organizational and partnership goals. Also, within 5 years of its launch, each institute is expected to be financially independent and sustainable using only non-Federal funds.

One example of the Department's efforts in this area includes our recently selected Institute for Advanced Composites Manufacturing Innovation, led by the University of Tennessee and headquartered in Knoxville, which already has 122 committed partners united toward the common goal of lowering overall costs for manufacturing advanced composites by 50 percent, reducing the energy use to do so by 75 percent, and increasing the ability to recycle composites by more than 95 percent. Advanced composites have the potential to deliver clean energy products with better performance and lower costs, such as lighter and longer wind turbines blades; high pressure tanks for natural gas- and hydrogen-fueled cars; lighter, highly energy-efficient industrial equipment; and lightweight vehicles.

In addition, the Department has released a Notice of Intent to issue a competitive solicitation in 2015 to fund a Clean Energy Manufacturing Innovation Institute focused on smart manufacturing. Smart manufacturing utilizes a suite of tools to enable real-time operational energy efficiency improvements in manufacturing ranging from unit processes to factory-wide integration to enterprise-wide energy management.

The Department also has active technical assistance programs aimed at reducing manufacturing energy intensity by 25% over ten years by engaging a diverse set of industry partners in effective business models, continuous improvement in energy efficiency, modeling key processes, and supporting standards and certifications for third-party services. One example is the 24 existing Industrial Assessment Centers (IACs), situated at universities with major engineering programs, which conduct energy efficiency, productivity improvement, and waste reduction assessments for small- and medium-sized manufacturer at no cost to them. DOE technical assistance also supports the achievement of the national goal set by President Obama of developing 40 gigawatts of new, cost-effective industrial combined heat and power by 2020. And, DOE provides tools to support improvements in a number of common systems in manufacturing facilities, including motor, steam, compressed air, and pumping systems.

In FY2016, DOE has requested $404,000,000 for the Advanced Manufacturing Office.

Weatherization and Intergovernmental Programs

For decades, states have demonstrated leadership through their unique authorities to develop and implement energy efficiency and renewable energy policies and programs. State governments wield considerable influence in the building sector through upgraded building codes and incentives; in the utility sector through energy efficiency and renewable energy targets and customer programs; and in the industrial sector with policies that encourage energy efficiency through activities such as energy audits and combined heat and power.

EERE's Office of Weatherization and Intergovernmental Programs (WIP) partners with its national network of state and local organizations to significantly accelerate the deployment of energy efficiency and renewable energy technologies and practices by a wide range of government, community, and business stakeholders.

Key recent WIP accomplishments include:

- **Provided critical funding for states to weatherize homes**. In FY 2014 alone, EERE helped improve the energy performance and comfort in the homes of approximately 38,000 low-income American families across the Nation, resulting in an estimated 1.1 trillion Btu of first-year energy savings and $16 million in first-year energy cost savings.

- **Maintained strict certification and auditing requirements to protect taxpayers**. In FY2014, WAP implemented national certifications and work specifications for residential retrofit worker training, energy audits and weatherization methods.

Included within the Office of Weatherization and Intergovernmental Programs are the Weatherization Assistance Program (WAP) and the State Energy Program (SEP).

The Weatherization Assistance Program provides funding through formula grants to increase the energy efficiency of dwellings owned or occupied by low-income persons, reduce their total residential energy expenditures, and improve their health and safety. Through retrofitting residential buildings, WAP activities reduce the cost of low-income household energy bills, which are significantly disproportionately higher relative to higher income households. Up to 40 million low-income households in the U.S. are eligible for low-income housing energy assistance. In FY2014, the Weatherization Assistance Program funding weatherized approximately 38,000 homes, exceeding its fiscal year goal of 24,600 homes retrofits for low income families by approximately 50 percent. The Weatherization Assistance Program also provides training and technical assistance to improve program effectiveness, service deliver, resource accountability, and operation efficiency.

Specifically, training and technical assistance funding supports the development and implementation of a variety of tools needed to implement work quality, training accreditation, and worker certification.

The State Energy Program assists states through competitive and formula funding in establishing and implementing energy efficiency and renewable energy plans, policies, and programs to reduce energy costs, increase competitiveness, enhance economic competitiveness, improve emergency planning, and improve the environment. States have purview over many of the policy and program levers that can catalyze greater investment in clean energy and help the country realize the suite of economic and environmental benefits associated with clean energy. The State Energy Program provides states with capacity building resources, technical assistance, and best practice sharing networks to facilitate the adoption of plans, policies, and programs that are appropriate based on state and regional circumstances.

In addition, the Local Energy Program, proposed as part of the Department's FY2016 Budget Request, is a new program that will provide support to local governments for energy planning, program development and implementation, analysis, and other related efforts through technical assistance and competitively awarded grants. Local energy efficiency policies, implemented at this scale, in a municipality, county or metropolitan area will lower energy costs, reduce greenhouse gas emissions, and support economic development goals. The objective of the Local Energy Program is to serve as a catalyst for developing creative and effective solutions through projects that improve local energy code implementation; expansion of energy upgrades in commercial buildings and residential buildings, upgrades to the energy efficiency of their own public facilities and operations; development of sustainable funding and financing resources.

In FY2016, DOE has requested $318,499,000 for the Office of Weatherization and Intergovernmental Programs.

Federal Energy Management

The U.S. Federal government is the Nation's single largest user of energy and has both a tremendous opportunity and an acknowledged responsibility to lead by example in saving energy. Since 1975, the Federal Government has reduced its energy intensity by 46.2 percent, and 20.6 percent from 2003. Federal GHG emissions have also dropped 17.2 percent since 2008. Additionally, the Federal Government is credited with using 9.2 percent of its electricity from

renewable sources. Federal Agencies have also made progress on a number of other fronts, like reducing water use by 19 percent since 2007[9].

A number of energy efficiency goals for the federal government were recently extended through 2025 by Executive Order 13693[10] signed in March 2015. It set goals to cut the Federal Government's greenhouse gas (GHG) emissions by 40 percent below 2008 levels by 2025 – saving tax payers up to $18 billion in avoided energy costs – and increase the share of electricity the Federal Government consumes from renewable sources to 30 percent. The new E.O. builds off of the strong progress the federal government has already made.

DOE plays a critical role in providing technical assistance to Federal agencies to increase understanding and accelerate cost-effective adoption of energy-saving technologies and strategies. DOE's Federal Energy Management Program (FEMP) has developed strategic programs to identify high impact opportunities with public-private sector partnerships as well as technical approaches to address critical barriers across the Federal Government.

FEMP activities contribute to reducing the energy intensity at Federal facilities, lowering their energy bills, and providing environmental benefits through:

- Interagency coordination to align interagency efforts surrounding Federal energy management planning and legislation compliance;
- Training federal agency managers about the latest energy requirements, best practices, and technologies;
- Reporting/tracking tools that provide centralized reporting, data collection, and strategic communication;
- Financial resources and technical assistance to increase Federal agencies' investments in energy efficiency, water conservation, and renewable energy; and
- Data Center Assistance to help agencies develop and implement data center efficiency projects through technical assistance, tools, and training that increase adaptation of measurement protocols, reporting mechanisms, and best practices.

Key recent FEMP accomplishments include:

[9] White House Fact Sheet: Reducing Greenhouse Gas Emissions in the Federal Government and Across the Supply Chain. https://www.whitehouse.gov/the-press-office/2015/03/19/fact-sheet-reducing-greenhouse-gas-emissions-federal-government-and-acro

[10] Executive Order 13693 is accessible at https://www.whitehouse.gov/the-press-office/2015/03/19/executive-order-planning-federal-sustainability-next-decade.

- **Federal Energy Efficiency Fund**. The First Federal Energy Efficiency Fund Solicitation in FY 2014 was awarded $5 million to 9 projects worth a total investment of $120 million in renewable energy and combined heat and power projects (a 24:1 leveraging ratio). Many of the projects are first-time projects for particular agencies, offering the potential of more in the future. The effort also brought forward a broad set of projects through which FEMP can provide other assistance to federal agencies.

- **New Better Buildings Challenge and Accelerator for Data Centers.** FEMP spearheaded a new Better Buildings Challenge and Accelerator for Data Centers announced in fall 2014, in coordination with EERE's Building Technologies Office. This Challenge has engaged federal agencies, national laboratories, and the private sector, including eBay and Staples, in efforts to greatly improve data center efficiency. Data center energy consumption is significant nationally and across the federal sector, and it can be reduced 20%–40% by applying best management energy efficiency measures and strategies typically with short returns on investment.

In December 2011, President Obama signed a Presidential Memorandum directing the Federal government to enter into a minimum of $2 billion in performance-based contracts over the next two years for Federal building energy efficiency. In May of 2014, the president announced the expansion and extension of the President's Performance Contracting Challenge (PPCC) to $4 billion by 2016. In FY 2016, DOE's Federal Energy Management Program will continue to support the PPCC by assisting agencies to successfully meet the $4 billion goal, and helping agencies to continue their acceleration of using performance contracts to meet future energy investment needs and goals. FEMP will also share and rely on best practices from the PPCC to partner with other government and private sector stakeholders/partners to accelerate their use of performance contracts. As of April 15th, 2015, federal agencies have developed a pipeline of about $4.81 billion in projects, which exceeds the $3.97 billion commitment. Agencies are working with FEMP and as of April 15th, 2015, have awarded a total of 201 projects with an investment value of $2.05 billion and an estimated pipeline of $2.76 billion.

In FY2016, DOE has requested $43,088,000 for the Federal Energy Management Program.

Conclusion

Through R&D, deployment, and collaborations at all levels of government and the private sector, the Department of Energy aims to capitalize on the opportunities that energy efficiency affords. The Department's efforts to lead in next-generation buildings and advanced manufacturing will result in a more secure, resilient, and competitive energy economy. While we are making progress, continued efforts are necessary to capture the full set of opportunities.

The Administration looks forward to continuing to work with the Congress on bipartisan legislation to support energy efficiency and boost U.S. competitiveness and job creation. From partnering with companies and businesses to reduce their energy bills through the Better Buildings Initiative, to Federal administrative actions to cut energy use across Federal facilities, the Department is committed to winning the future by catalyzing a homegrown, clean energy economy in the United States.

Thank you again for the opportunity to speak to this important issue, and I would be happy to answer any questions.